ISSN 0167-5087

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MODERN PROBLEMS IN CONDENSED MATTER SCIENCES

Volume 10

Electron-Electron Interactions in Disordered Systems

edited by A.L. EFROS, *A.F. Ioffe Physico-Technical Institute, Leningrad, U.S.S.R., and* M. POLLACK, *Brown University, Providence, RI, U.S.A.*

1985 xiv + 628 pages Price: US $140.75/Dfl. 380.00 ISBN 0-444-86916-6
Subscription Price: US $119.75/Dfl. 323.00

Two fundamental problems of condensed-matter physics commanded the attention of theorists in past decades: disorder and the Coulomb interaction between electrons.

As many concepts and methods in solid-state theory depend on the periodicity of crystal lattices, the problem of disorder appears to be a formal one in the first place. However, since Anderson's work on disorder-induced localisation (1958), it has been clear that the lack of periodicity can lead to qualitatively novel features.

The Coulomb interaction between electrons manifests itself in most low-temperature properties of solids and can also lead to localization and metal-insulator transitions (Mott, 1949).

The present volume deals with the interplay of disorder and the Coulomb interaction. Prominent experts give state-of-the-art reviews of the theoretical and experimental work in this field and make it clear that the interplay of the two effects is essential especially in low-dimensional systems. Chapters addressing the insulating regime, the weakly localized regime, the metallic regime, and the neighborhood of the metal-insulator transition are included. Reflecting the importance of contributions to developments in this field from all parts of the world, distinguished authors from the U.S.A., U.S.S.R., Europe and Japan have contributed to the volume.

CONTENTS: Preface to the series. Introduction. 1. Electron-electron interaction in disordered conductors *(B.L. Altshuler and A.G. Aronov).* 2. Interaction effects in the weakly localized regime of two- and three-dimensional disordered systems *(H. Fukuyama).* 3. A review of the metal-insulator transition in doped semiconductors *(R.F. Milligan, T.F. Rosenbaum, R.N. Bhatt and G.A. Thomas).* 4. The effect of Coulomb interactions on electronic states and transport in disordered insulators *(M. Pollak and M. Ortuño).* 5. Coulomb interaction in disordered systems with localized electronic states *(A.L. Efros and B.I. Shklovskii).* 6. H-like impurity centers, molecular complexes and electron delocalization in semiconductors *(E.M. Gershenzon, A.P. Mel'nikov and R.I. Rabinovich).* 7. Electron-electron interactions in the Anderson-localised regime near the metal-insulator transition *(H. Kamimura).* 8. Disorder and interactions in the system of quasi one-dimensional electrons *(L.P. Gor'kov).* Author index. Subject index.

North-Holland Physics Publishing
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General Editors:

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Oh, how many of them there
are in the fields!
But each flowers in its
own way –
In this is the highest achievement
of a flower!

Matsuo Bashó
1644–1694

VOLUMES PUBLISHED:

Volume 1
Surface Polaritons
edited by V.M. AGRANOVICH *and* D.L. MILLS
1982 xvi + 718 pages
Price: US $146.75/Dfl. 345.00
ISBN 0-444-86165-3

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P.O. BOX 103, 1000 AC, AMSTERDAM, THE NETHERLANDS
In the U.S.A. and Canada: Elsevier Science Publishing Co. Inc, 52 Vanderbilt Ave. New York, NY 10017

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edited by ARTHUR FONTIJN, *Rensselaer Polytechnic Institute, Troy, NY, U.S.A.*

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The phenomena of chemiluminescence (or more broadly chemi-excitation) and chemi-ionization have major similarities from a fundamental kinetic and dynamic point of view. However, since the former has primarily been investigated using optical spectroscopic techniques and the latter largely by mass spectroscopic (and other gaseous electronic) methods, the two phenomena have apparently never explicitly been discussed together in one volume. In addition to a number of review articles on each individual subject, several meetings and books have had chemiluminescence and bioluminescence as their theme and those have been dominated by condensed phase work. On the other hand, chemi-ionization is often discussed in the context of gaseous electronics, plasma chemistry and combustion. It is the goal of this book to present a more unified understanding of the two phenomena.

This up-to-date overview is aimed at both workers in the field and at beginning graduate students. As a particular aid to the latter, each author has included a brief review of the subject and indicated fruitful areas for future research.

CONTENTS: 1. Introduction and Overview *(A. Fontijn).* 2. Chemiluminescent Chemi-Ionization *(J.S. Winn).* 3. The M + X_2 Reactions: A Case Study *(A. Menzinger).* 4. Penning Ionization and Chemi-Ionization in Reactions of Excited Rare-Gas Atoms *(A.J. Yencha).* 5. Recent Advances in the Theory of Chemi-Ionization *(H.P. Saha, K.S. Lam and T.F. George).* 6. The Enhancement of Chemi-Ionization in Hydrocarbon Flames by Laser Excited CH* (A2Δ) and CH* ($B^2\Sigma^-$) Radicals *(T.A. Cool and P.J.H. Tjossem).* 7. Electronic Chemiluminescence from Ion-Molecule Reactions *(Ch. Ottinger).* 8. Nascent Product Vibrational State Distributions of Thermal Ion-Molecule Reactions Determined by Infrared Chemiluminescence *(C.E. Hamilton and S.R. Leone).* 9. Hydrogen Abstraction Reactions of F, Cl and O Atoms Studied by Infrared Chemiluminescence and Laser-Induced Fluorescence in a Flowing Afterglow Reactor *(B.S. Agrawalla and D.W. Setser).* 10. On the Extraction of Population Information from the Chemiluminescence Spectra of Diatomic Molecules *(M.G. Prisant and R.N. Zare).* 11. Spin-Orbit Effects in Chemiluminescent Reactions of State-Selected Ca($^3P_1$o) *(P.J. Dagdigian).* 12. Pseudo-Quenching Model Studies of Spin-Orbit State Propensities in Reactions of Ca(4s4p3p) with Cl_2 *(M.H. Alexander).* 13. Theoretical Studies of the Reactions of Atoms with Small Molecules *(K.D. Jordan).* 14. Probing Ultrafast Energy Transfer among the Excited States of Small High Temperature Molecules *(J.L. Gole).* 15. Electronic Energy Transfer from NF (b1Σ) to IF *(A.T. Pritt and D.J. Benard).* 16. Chemiluminescent Association Reactions in the Upper Atmosphere *(E.A. Ogryzlo).* 17. Creation of Electronically Excited States by Heterogeneous Catalysis *(J.A. Halstead, N. Triggs, A.L. Chu and R.R. Reeves).* 18. Infrared Chemiluminescence from the Products of Exoergic Surface Catalyzed Reactions *(B. Halpern and M. Kori).* 19. Chemiluminescence in Air Pollutant Monitoring *(D.H. Stedman, D.L. McElwee and G.J. Wendel).* Author Index. Subject Index.

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